



Designation: D 5019 – 96^{e1}

Standard Specification for Reinforced Non-Vulcanized Polymeric Sheet Used in Roofing Membrane¹

This standard is issued under the fixed designation D 5019; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

^{e1} NOTE—Table 1 was corrected editorially in May 1996.

1. Scope

1.1 This specification covers reinforced non-vulcanized polymeric sheet made from chlorosulfonated polyethylene (CSM)² and poly-isobutylene (PIB) intended for use as a single-ply roof membrane exposed to the weather. The sheet shall be reinforced with fiber or fabric.

1.1.1 The polymers used in these sheets have thermoplastic characteristics at time of installation. The chlorosulfonated polyethylene will vulcanize in place under ambient conditions on a roof.

1.2 The tests and property limits used to characterize these sheets are minimum values specific for each classification.

1.2.1 In-place roof systems design criteria such as fire resistance, field seaming strength, impact/puncture resistance, material compatibility, and uplift resistance, among others, are factors that must be considered, but are beyond the scope of this specification.

1.3 The following precautionary caveat pertains to the test methods portion only, Section 8, of this specification: *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

D 412 Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers—Tension³

¹ This specification is under the jurisdiction of ASTM Committee D08 on Roofing, Waterproofing, and Bituminous Materials and is the direct responsibility of Subcommittee D08.18 on Nonbituminous Organic Roof Coverings.

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² The terms CSPE for chlorosulfonated polyethylene is commonly used in the roofing industry. In accordance with Practice D 1418, some documents use CSPE as an abbreviation for CSM.

³ Annual Book of ASTM Standards, Vol 09.01.

D 413 Test Methods for Rubber Property—Adhesion to Flexible Substrate³

D 471 Test Method for Rubber Property—Effect of Liquids³

D 518 Test Method for Rubber Deterioration—Surface Cracking³

D 751 Test Methods for Coated Fabrics⁴

D 1004 Test Method for Initial Tear Resistance of Plastic Film and Sheeting⁵

D 1149 Test Method for Rubber Deterioration—Surface Ozone Cracking in a Chamber³

D 1204 Test Method for Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature⁵

D 1418 Practice for Rubber and Rubber Latices—Nomenclature³

D 2136 Test Method for Coated Fabrics—Low Temperature Bend Test³

G 26 Practice for Operating Light-Exposure Apparatus (Xenon Arc-Type) With and Without Water for Exposure on Nonmetallic Materials⁶

G 53 Practice for Operating Light- and Water-Exposure Apparatus (Fluorescent UV-Condensation Type) for Exposure of Nonmetallic Materials⁶

3. Classification

3.1 The following types are used to identify the principal polymeric component of the coating portion of the sheet:

3.1.1 *Type I*—Chlorosulfonated polyethylene (CSM), and

3.1.2 *Type II*—Polyisobutylene (PIB).

3.2 The following grades describe the sheet construction:

3.2.1 *Grade 1*—Backed with fibers, and

3.2.2 *Grade 2*—Internally reinforced with fabric.

⁴ Annual Book of ASTM Standards, Vol 09.02.

⁵ Annual Book of ASTM Standards, Vol 08.01.

⁶ Annual Book of ASTM Standards, Vol 14.02.

TABLE 1 Physical Properties of the Backed or Reinforced Sheet

Type (Polymer) Grade (Reinforcement)	I (CSM) 2	II (PIB) 1
Property		
Thickness, min, in. (mm)	0.040 (1.02)	0.080 (2.0)
Breaking strength, min, lbf (N)	210 (935) (fabric)	160 (710)
Elongation, min, %	16.5 (fabric)	35
Tearing strength, min, lbf (N)	68 (300)	20 (89)
Low temperature bend	pass	pass
Linear dimensional change, max, %	2	0.5
Fabric adhesion, min, lbf/in., width (N/m)	NA ^{A,B}	20 (3500)
Ply adhesion, min, lbf/in. (N/m)	7.5 (1310)	NA ^B
Hydrostatic resistance, min, psi (kPa)	330 (2270)	175 (1200)
Ozone resistance, no cracks	pass	pass
Weather resistance, no cracks or crazing	pass	pass

^AInternal delamination of backing occurs prior to failure at bond between backing and coating.

^BNA = not applicable.

3.3 A general description of reinforcing/backing material including the type of fiber used and the weight per unit area of the reinforcing or backing material shall be provided, upon request.

4. Materials and Manufacture

4.1 The coating shall be formulated from the appropriate polymers, as listed in 3.1, and other compounding ingredients. The principal polymer used in the coating shall be one of those listed in 3.1 and shall be a minimum of 90 % for Type I and 75 % for Type II in relation to the total polymer present.

4.2 The sheet construction shall be as listed in 3.2.

4.3 The sheet shall be capable of being bonded to itself to make watertight field splices and repairs. The manufacturer or supplier shall recommend bonding methods and materials.

5. Physical Properties

5.1 Table 1 contains physical property requirements that shall be met when using the indicated class of reinforcement. (The values shown were obtained from sheets made with coatings having the properties described in Table 2.)

5.2 Table 2 contains property values for the coating portion on the weather side of the sheet. (When requested, the manufacturer shall provide a sample of the coating used on the weathering side of the supplied sheet at the thickness applied during manufacture, for testing purposes.) See 8.2.

5.3 Other requirements shall be agreed upon between the purchaser and the supplier.

6. Dimensions, Mass, and Permissible Variations

6.1 The width and length of the sheet shall be agreed upon between the purchaser and the supplier.

6.1.1 The width and length tolerance shall be + 3, - 0 %.

TABLE 2 Physical Properties of the Coating Portion on the Weather Side of the Sheet, (No Backing or Internal Reinforcement)

Type	I (CSM)	II (PIB)
Property		
Tensile strength, min, psi (MPa)	735 (5.1)	680 (4.7)
Elongation, min, %	250	470
Tear resistance, min, lbf/in. (kN/m)	195 (34.0)	100 (15.8)
Ozone resistance, no cracks	Pass	Pass
Water absorption, max, mass, %	10	0.2

6.2 Sheet thickness specified greater than the minimum shall be agreed upon between the purchaser and the supplier as part of the purchase contract.

6.2.1 The thickness tolerance shall be + 15, - 10 % of the specified nominal thickness. In no case shall the total sheet thickness be less than the minimum listed in Table 1. The minimum thickness of coating on Grade 1 sheets (backed with fibers) shall not be less than 0.020 in. (0.51 mm). The minimum thickness of coating on the weather side of Grade 2 sheets (internally reinforced with fabric) shall not be less than 0.011 in. (0.28 mm). (See Annex A1 for method of thickness measurement for coating on weather side of sheet.)

7. Workmanship, Finish, and Appearance

7.1 The sheet, including factory seams if present, shall be watertight and visually free of pinholes, particles of foreign matter, undispersed raw material, or other manufacturing defects that might affect serviceability. If irregularities in the form of pock marks, (See Note) appear on a sheet (or portion thereof) then its rejection shall be negotiated between involved parties.

7.2 On Grade 2 sheet, the weather side of the sheet shall be identified as agreed upon between involved parties, and so that it is apparent to the applicator.

7.3 Edges of the sheet shall be straight and flat to permit seaming to one another without fishmouthing.

NOTE 1—Pock marks are oblong depressions, cavities, or craters on the surface coating of the sheet that have approximate surface dimension of 1/8 by 1/16 in., (3.2 by 1.6 mm) and have a maximum depth approaching one half of the coating thickness.

8. Test Methods

8.1 *Backed or Reinforced Sheet, (See Table 1):*

8.1.1 *Dimensions*—In accordance with Test Methods D 751, after unrolling or unfolding and permitting the sheet to relax at 73 ± 4°F (23 ± 2°C) for 1 h minimum.

8.1.2 *Breaking Strength and Elongation*—In accordance with Test Methods D 751, grab method.

8.1.3 *Tearing Strength*—In accordance with Test Methods D 751, tongue tear method, 8 in. (200 mm) minimum by 8 in. (200 mm) minimum specimen size.

8.1.4 *Low-Temperature Bend*—In accordance with Test Method D 2136 at - 40 ± 4°F (- 40 ± 2°C).